

# PATENT SPECIFICATION

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## (54) SOLDERING ELECTRICAL COMPONENTS TO THICK FILM CIRCUITS

(71) We, JOSEPH LUCAS (INDUSTRIES) LIMITED, a British Company, of Great King Street, Birmingham 19, do hereby declare the invention, for which we pray that a Patent may be granted to us, to be particularly described in and by the following statement:—

This invention relates to the soldering of an electrical component to a fired-paste electrical circuit, such a circuit being hereinafter referred to as a thick film circuit.

It is an object of the invention to provide a method of producing a soldered joint which will remain sufficiently strong after prolonged exposure to elevated temperature environments.

In accordance with the invention a method of soldering, with a solder, containing lead and tin, an electrical component on to a fired-paste circuit, i.e. a thick film circuit, comprises the steps of applying to a terminal region of said circuit a surface layer formed from a glass frit in admixture with either platinum or palladium, and subsequently securing said component to said surface layer with said solder.

The terminal region may be formed by a layer of fired palladium/gold/glass frit material or fired palladium/silver/glass frit material.

The invention also resides in a thick film circuit having a component soldered thereto by the above defined method.

Terminal regions of a thick film circuit are prepared by depositing by screen printing and firing pastes, layers of conductive material, such as the palladium/gold/glass frit paste material marketed by E.I. Du Pont De Nemours Co. under the designation 8451 or the palladium/silver/glass frit paste material marketed by Englehard Industries Limited under the designation 9154. In each case the substrate may be a high alumina ceramic e.g. 96% alumina. To the fired palladium/gold/glass frit and fired

palladium/silver/glass frit a further, surface layer of fired platinum/glass frit paste material, obtainable from Englehard Industries Limited under the designation 9650, is applied.

Tests have been carried out on soldered joints between electrical components and fired paste thick film circuits, applied to a glass insulant, which may either be a devitrified glass such as that marketed by E.I. Du Pont de Nemours Co. under the designation 8299 or a ceramic loaded glass using the surface layer material above described. The solders used were commonly available 60% tin—40% lead and 62% tin—36% lead—2% silver varieties although any lead-tin and lead-tin-silver solders could equally well be employed. In each case the use of the terminal surface material, i.e. the fired platinum/glass frit paste, substantially improved the useful life of the soldered joints.

As an alternative to the fired platinum/glass frit paste surface layer material a fired palladium/glass frit paste material may be employed.

### WHAT WE CLAIM IS:—

1 A method of soldering, with a solder containing lead and tin, an electrical component on to a fired-paste electrical circuit, i.e. a thick film circuit, comprising the steps of applying to a terminal region of said circuit a surface layer formed from a glass frit in admixture with either platinum or palladium, and subsequently securing said component to said surface layer with said solder.

2 A method as claimed in Claim 1 wherein said surface layer is applied as a paste and subsequently fired.

3 A method of soldering an electrical component to a fired-paste circuit substantially as hereinbefore described.

4 A fired-paste circuit having an electrical component soldered thereto by a method as claimed in any preceding claim.

[Price 25p]

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